International Journal of Business
Management & Research (IJBMR)
ISSN (P): 2249-6920; ISSN (E): 2249-8036
Vol. 11, Issue 2, Dec 2021, 1-14

TRANS STELLAR
•Journal Publications •Research Consultancy

DETERMINANTS OF SYSTEMATIC RISK IN INFORMATION TECHNOLOGY SECTOR OF THE INDIAN ECONOMY

KHUSHBOO GUPTA[1], SESHANWITA DAS[2] & O. S. DEOL[3]

[1]*Ph. D Scholar at Amity College of Commerce and Finance, Amity University, Noida, UP, India*

[2]*Associate Professor at Amity College of Commerce and Finance, Amity University, Noida, UP, India*

[3]*Associate Professor at Department of Commerce, Shaheed Bhagat Singh Evening College, University of Delhi, New Delhi India*

ABSTRACT

Systematic risk is the risk arising from market factors that commonly affect all the firms. Capital Asset Pricing Model (CAPM) suggests that the firm-specific risk, called unsystematic risk, can be diversified away by portfolio creation. Hence, only systematic risk is relevant in financial decision making. The objective of this paper is to study the relationship between company financial factors and macro-economic factors and the systematic risk of firms in Information Technology sector of the Indian Economy. The study is undertaken on Nifty IT index companies for the years 2004 to 2017. Using panel data regression techniques, it is concluded that, out of the company variables, return on capital employed and asset growth are positively and significantly related to systematic risk (measured by beta), whereas price to book ratio and net profit margin are negatively related to systematic risk. And, out of the macro-economic variables, interest rate and international competitiveness (measured by current account balance as percentage of GDP) are negatively significantly related to systematic risk.

KEYWORDS: Systematic Risk, Beta, Panel Data Analysis & ITS Sector

Received: Apr 21, 2021; **Accepted**: May 11, 2021; **Published**: Jun 11, 2021; **Paper Id**.: IJBMRDEC20211

Original Article

1. INTRODUCTION

The global economy is currently going through a Digital Revolution which is characterised by the explosion of information technology which touches the everyday lives of society. India is playing a major role in this by contributing around 75 % to the global talent pool. The information technology sector contributes around 8% to India's GDP and has a share of more than 45 % in India's services exports. The Foreign Direct Investment (FDI) attracted by these sector ranks 2nd in the FDI inflow of the country (IBEF, 2019). These statistics show the importance of this sector for investors and for the economy.

Risk and return are the basis of every investment decision. It is important for investors to understand both of these for rational decision making. Among the many theories that explain the relation between risk and return, Capital Asset Pricing Model (CAPM) is used very commonly which explains a positive relation between risk and return. This model differentiates between systematic and unsystematic risk and considers only systematic risk. Systematic risk is the risk from common factors that affect all firms, beyond the control of any specific firm because these factors are external to any organisation. This means systematic risk affects all the firms and hence is also called non-diversifiable risk or market risk. Systematic risk can arise from fiscal, regulatory, monetary policies; purchasing power risk, exchange rate risk, political risk, recessions and even natural and man-made

disasters and terrorist attacks. The aforementioned factors affect most or all the firms in the market and hence cannot be diversified by investing in multiple securities. On the other hand, the risk which can be diversified away is called unsystematic risk or firm specific risk. It's caused by factors specific to each organisation such as operating factors, financial factors and managerial capability. CAPM is based on assumption that unsystematic risk can be diversified by any investor but still, the systematic risk will remain, and this risk will affect the return from the security. (Jordon, Ross & Wester Field) Hence, this study will focus only on systematic risk. Now that systematic risk is through factors affecting all the firms, yet the measure of systematic risk (beta) is different for different firms. Finding out the factors causing this difference in betas is the motive of this study. Thus, the objective of the paper can be stated as: 'to study the relationship between select company financial factors and macro-economic factors with systematic risk of the Information Technology sector companies of the Indian economy'. As described above, the IT sector is a major investment destination, hence it is even more important to deliberate upon the risk factors for this sector.

The current study will help managers of organisations understand various factors that affect risk, and in turn cost of capital and the value of the firm. This way they will be in a better position to manage risk. Also, investors will be able to make improved investment decisions after understanding the risk factors affecting organisations of the IT sector. They will be in a better position to observe relevant variables and anticipate their impact. They will be able to make improved risk forecasts of the securities.

The paper is organized into 5 sections:1) Introduction, 2) Review of literature,3) methodology, 4) Findings and discussion and 5) Conclusion.

2. REVIEW OF LITERATURE

Most of the prior studies in the field of systematic risk and its determinants have used financial measures of companies to explain systematic risk. Comparatively, there are fewer studies studying the impact of macroeconomic variables on systematic risk. A review of studies on financial variables is done first, followed by studies taking macro-economic factors as explanatory variables.

Commonly used financial variables to explain systematic risk are profitability, liquidity, leverage, size, efficiency, growth and dividend payout. For each of these variables, different researchers have used different measures. For example, some have measured profitability by Return on Capital employed, some by Return on Assets, while others by Net Profit Margin. Besides these common variables, there are specific variables for some sectors like loan loss ratio for banking or safety measure for the airline industry.

Logue & Merville (1972) based their study on 287 firms out of "Fortune 500" companies to show that Leverage was positively related while size, profitability & dividend payout were negatively related with systematic risk. Growth rate was a statistically insignificant variable. Iqbal & Shah (2012) explored the relationship between systematic risk of 93 non-financial firms listed on Karachi stock exchange and 8 financial variables. The study spanning 5 years from 2005 till 2009 showed that profitability, size and growth are positively related while liquidity, Leverage, dividend payout and operating efficiency are negatively related with beta. Alaghi (2013) derived from their study on 457 companies from Tehran stock exchange that liquidity and operating efficiency are negatively related to systematic risk while leverage and profitability are positively related to systematic risk. Size was an insignificant variable, but R square value of their study wasn't too high, which means more factors had to be considered. Aruna&Warokka (2013) conducted a similar study in the emerging

market of Indonesia, on its 15 most traded manufacturing stocks. Interestingly none of the accounting measures (current ratio, debt to total assets ratio, size & growth) influence beta.

Hospitality and travel industries have attracted the attention of many researchers in this field. Borde (1998) examined 52 US restaurant companies from 1992 to 1995 and showed that growth and liquidity are positively related with systematic risk while dividend payment and return on assets are negatively related. Gu & Kim (2002) in their study titled "Determinants of Restaurant Systematic Risk: A Re-examination" studied relationship between 75 US restaurant companies' systematic risk and seven financial variables. The adjusted r square of their model however was very low, thus they concluded that they might be missing some important factors in their model. So, they suggested that more variables and different variables can be used to improve the explanatory power of the model. Kim, Gu & Mattila (2002) investigated 19 US hotel REITs from 1993 to 1999 to understand the relation between systematic risk and financial variables. The authors found systematic risk to be positively related with growth and Leverage but negatively related with size. Kim, Kim & Gu (2012) examined systematic risk of 31 US hotel firms (from 2004-2008) and showed a positive relation between systematic risk and growth and leverage and a negative relationship with firm size. Mar-Molinero, Menéndez-Plans & Orgaz-Guerrero(2017) examined 45 listed European accommodation and food service companies. Their study made a distinction between two sub periods of before and after the financial crisis of 2008 and concluded that factors determining systematic risk are different in two sub periods, showing that the crisis impacted the hospitality industry in this respect. Jiao (2013) compared different divisions within the hospitality industry with respect to the factors that determine their systematic risk. The author concluded that not only the factors affecting systematic risk were different, but their impact also was different. Hotel firms' beta was positively associated with liquidity, leverage and firm size; and negatively associated with profitability, efficiency and dividend payout. Restaurant firms were positively related with growth and degree of operating leverage; and negatively with efficiency. Airline firms were positively related with liquidity, firm size and safety. A very recent and relevant study is by Lee et al. (2015) on "Determinants of systematic risk in the online travel agency industry". With the recent surge in e-commerce, this study is a realistic and important for today's business managers. Using data for 10 years, from 2001 to 2010, for 10 US Online Travel Agency (OTA) companies listed on NYSE index, the authors concluded that liquidity, size and advertising expenditure and systematic risk are negatively related. This conclusion does substantiate the notion that advertising and marketing are key success factors especially in e-commerce enterprises. Increase in advertising expenditure is associated with decrease in systematic risk. A factor specific to airline industry is safety. Lee & Jang (2007), in their study on US airline industry studied this factor (among others), for 16 airline companies for years 1997 to 2002. They concluded that safety and both systematic as well as total risk are negatively related.

Mardini (2013) conducted a study on Jordanian banking sector and concluded that beta is positively related with size, volume of loans & Leverage ratio while it's negatively related with profitability, liquidity and loan loss provisions. Kumar, Aleemi & Ali (2015) conducted a study on 17 banks listed on Karachi Stock Exchange of Pakistan, for the years 2006 to 2012, to determine key variables that affect their systematic risk. Using panel data techniques, the authors found out that loan portfolio quality of banks and their betas are positively related. On the other hand, Biase & D'Apolito (2012) used relative volume of loans along with loan loss provisions and intangible assets of banks as independent variables, in their study on systematic risk in the Italian banking system. Using the data of 38 bank holding companies and commercial banks (listed on Milan Stock Exchange) for a period of 20 years, from 1992 to 2011, and panel data techniques of data

analysis, it is evidenced that volume of loans and intangible assets correlates positively with bank equity beta, while loan loss provisions correlates negatively.

Misra (2011) only analysed the relation between market risk (systematic risk) and a firm's Research and Development (R&D) intensity on 333 Indian Industrial firms. The study spanning from 2005 to 2009 found an inverse relation between the two variables, meaning that the firms which invest more in R&D activities gain in terms of reduced systematic risk. However, the author used many other accounting variables as control variables and further observed a significant impact of sales variability and dividend payout ratio on market risk. Oikonomou, Brooks &Pavelin (2012), in their paper titled "The impact of corporate social performance on financial risk and utility: a longitudinal analysis", used S&P 500 companies' data to examine the association between financial risk, systematic risk and corporate social performance. The study used panel data analysis techniques on the sample, for the period 1992 to 2009. The result found was a negative relation between corporate social responsibility and systematic risk and a positive relation between corporate social irresponsibility and systematic risk. This result supports the belief that sustainable business practices not only benefit society but also the businesses and hence reduce their risk. However, the authors could not confirm the "wealth enhancing" effects of fulfilling corporate social responsibility.

Study by Robichek & Cohn (1974) attempted to find if beta varied with changes in macro-economic factors of real economic growth and inflation. They concluded that beta does vary with these two variables, even though this can be proved for only a small number of firms. Another study by Karakus (2017), undertaken on BIST (Borsa Istanbul) 100 companies of Turkey, also showed a relation of beta with inflation (CPI) and economic growth (GDP); however, the relationship was negative with CPI and previous term GDP per capita. And, relation with same period GDP per capita was insignificant. Another study relating beta with economic growth is by Boz, Menéndez-Plans & Orgaz-Guerrero (2015), which depicted a negative relation between GDP growth and beta. Further, exchange rate variation and Dow Jones Industrial Average's profitability also have negative relation with beta. With seven macro and seven financial variables, the study concluded that macro variables have greater impact on beta than accounting variables, of which only size of firms influences stock risk. Angel, Menéndez-Plans &Orgaz-Guerrero (2018) showed a negative relation between inflation, stock market index and beta. Andersen, Bollerslev, Diebold & Wu (2005) explored the relation between realized beta and realized variance and macro-economic fundamentals. They concluded that industrial production and betas are negatively related. Another variable showing a significant (and positive) relationship with beta is government deficit, in the study by Al-Qaisi (2011). This study also took inflation and taxes for the analysis, but these factors didn't relate significantly.

The review of literature clearly shows the dearth of studies in this area with respect to the Indian market. Of the innumerable studies mentioned above, only one was conducted on Indian firms, by Misra (2011). Even this study restricted to just one independent variable, i.e. R&D intensity, (taking others as control variables). Further, the previous researches presented contradicting results. Thus, the present study will be an attempt to extend the existing literature by focusing on the Indian market.

3. METHODOLOGY

Patel & Olsen (1984) conducted a study of Real Estate Investment Trusts (REITs) to find the financial determinants of systematic risk and concluded that the relationship between financial variables and systematic risk has better explanatory power when explained for one industry as compared to when the firms are grouped across industries. This conclusion helped in undertaking a sector specific study for the current paper.

3.1. Base Theory: CAPM is used as the base model in this paper. The model suggests that the expected return from a security can be found out using the following equation:

$ER_s = R_f + (ER_M – R_f)*\beta$

Where ER_s = Expected Return on security S

R_f = Risk free rate of return

ER_M = Expected Return on market portfolio

β = beta, measure of systematic risk.

The equation shows that the expected return depends on pure time value of money (Rf) and systematic risk ((ERm – Rf)*β). Investors like to be compensated for opportunity cost of their capital as well as for additional risk that they undertake by investing in the concerned security. The unsystematic risk can be diversified away by creating portfolio of investments. Based on CAPM, beta is used as the measure of systematic risk, in the present study.

3.2. Sample

With Information Technology (IT) sector being an important part of the Indian growth story, the companies in this sector are sought to be studied in this paper. To represent this population, the companies listed on Nifty IT index are selected and studied. Out of the 10 companies comprising Nifty IT index, 6 were selected based on the availability of data for the period under study viz. HCL Technologies Ltd., Infosys Ltd., Oracle Financial Services Software Ltd., Tata Elxsi Ltd., Wipro Ltd. and KPIT Technologies Ltd. Period of study is 14 years from 2004 to 2017.

3.3. Data Collection

Historical share prices of the selected companies were retrieved from NSE website (Security Wise Archives Equities) and adjustment for bonus issue and splitting of shares has been done such that the previous price and current price of shares for the date of record has been kept same. This makes the returns zero and hence removes the impacts of the said company activities. Financial data of each company was retrieved from CMIE Prowess IQ database. The variables which weren't available in this database were taken from annual reports of these companies for the years under study. The macro-economic data was retrieved from websites of UNCTAD (The United Nations Conference on Trade and Development), World Bank, IMF (International Monetary Fund), MSCI (Morgan Stanley Capital International) and RBI (Reserve Bank of India).

3.4. Explained Variable

Beta is the measure of systematic risk and is the dependent variable for our regression model. Using Nifty 500 index as proxy for market, the following regression equation was used to calculate beta.

$$R_s = \alpha + \beta R_M + e$$

Where, R_S = Return on each individual security calculated using daily prices such that $R_S = (P_t - P_{t-1})/P_{t-1}$

R_M = Return on Nifty 500 index

α = intercept of regression line

β = beta of the security (slope of line)

e = error term

Each year's beta is calculated using daily prices of the past 1 year. The daily prices of stocks are used to calculate the security returns and the daily values of Nifty 500 are used to calculate market returns. Security returns are then regressed on market returns to get the values of beta.

3.5. Explanatory Variables

With the help of literature review, 22 financial variables and 7 macro-economic variables are identified and included in the current study. Financial variables are: Earnings Before Interest and Taxes (EBIT), Net Profit Margin, Return on Total Assets (ROTA), Return on Capital Employed (ROCE), Profit After Tax (PAT), Profit Before Tax (PBT) and Earnings Per Share (EPS) as measures of profitability; Operating Leverage (OL) and Financial Leverage (FL) as measures of risk; total market capitalization and total sales to measure size of firm; current ratio, quick ratio and debt to equity ratio to measure liquidity; equity dividend as percentage of PAT to reflect the dividend policy of businesses; Z score as a measure of default risk; earnings growth and asset growth as measures of growth of firms; asset turnover to measure efficiency of businesses; Price to Book ratio (PB) and Price to Equity ratio (PE) to account in the market information about the firms and Research and Development (R&D) Intensity to account for the research efforts of each business. Macro-economic variables used are: Annual GDP growth rate, Current Account balance (CAB) as percentage of GDP, MSCI all country world index annual percentage returns, interest rate (Repo rate), Index for Industrial Production (IIP), Consumer Price Index (CPI) growth rate (as measure of inflation) and Exchange Rate (vis-à-vis dollar).

3.6. Model

Firstly, stepwise backward regression is done to reduce the number of variables and keep statistically significant ones only. This way 29 variables are reduced to 11. Then panel regression techniques are applied. Fixed effects regression is done, followed by random effects regression. Then Hausman test is applied to select the more suitable method. The Hausman test suggests using fixed effects model. The regression equation for our model is as follows:

$$Beta_{it} = \alpha_i + \beta_1 RoCE_{it} + \beta_2 PB_{it} + \beta_3 PBT_{it} + \beta_4 NPM_{it} + \beta_5 AssetGrowth_{it} + \beta_6 PE_{it} + \beta_7 FL_{it} + \beta_8 RnD_{it} + \beta_9 GDPgrowth_{it} + \beta_{10} CAbal_{it} + \beta_{11} Int_{it} + e_{it}$$

4. FINDINGS AND DISCUSSION

4.1. Descriptive Statistics

All the variables used in the study are summarised in the table above; in terms of number of observations, mean values, standard deviations and minimum and maximum values. As there are 6 companies and 14 years of data, the number of observations of each variable is 84. The mean value of beta shows that individual stocks are overall lesser volatile as compared to the market. The distribution of other variables can also be understood with the above statistics.

Table 1: Summary Statistics of Variables

Variable	Obs	Mean	Std. Dev.	Min	Max
Beta	84	0.843024	0.311496	0.218113	1.952334
ROCE	84	-0.07405	7.144493	-29.68	17.82
PB	84	0.02631	2.37325	-7.05	6.15
PBT	84	4484.081	8101.218	-19169.9	30166.6
Net Profit Margin	84	-0.02024	3.69137	-9.84	11.13

Table 1: Contd,.

Asset Growth	84	0.226895	0.186454	-0.37678	1.020213
PE	84	22.7775	8.722938	3.15	49.95
FL	84	-0.87958	15.79816	-137.941	25.54322
Annual GDP growth rate	84	7.612885	1.740711	3.890957	10.25996
CAB	84	-1.84891	1.307074	-4.91549	0.11247
Interest Rate	84	0.068036	0.010507	0.05	0.085
RnD intensity	84	0.001017	0.011051	-0.01968	0.086334

Note: ROCE: Return on Capital Employed; PB: Price to Book ratio; PBT: Profit Before Tax; PE: Price Equity ratio; FL: Financial Leverage; CAB: Current Account Balance as percentage of GDP

4.2. Diagnostic Tests

The 29 explanatory variables in total were first checked for stationary, which is crucial for panel data analysis. Im, Pesaran and Shin unit root test was used (results are shown in Appendix A1). The non-stationary series were used with their stationary 1st differences.

Including so many variables in a regression model can cause the problem of multi collinearity which can weaken our model and results. Hence backward stepwise regression method is used to eliminate the statistically insignificant variables. Then the variables with high correlation are also removed to come to the final regression model. Correlation matrix is given in Appendix A2. In the final model 11 variables are left, with 8 financial variables (company specific factors) and 3 macro-economic variables. These variables are ROCE, PB, PBT, PE, net profit margin, asset growth, FL, R&D intensity, annual GDP growth rate, CAB and interest rate. In fact, an analysis by Martikainen (1991) on Finnish data showed that leverage was the most important variable affecting systematic risk and that financial decision makers might be better off if they concentrated on only key ratios, instead of evaluating a large number of ratios.

4.3. Panel Data Regression

Using the 11 variables mentioned above, first a Fixed Effects regression is conducted, followed by a Random Effects regression. Then, Hausman Test is done to decide between Fixed and Random Effects models. These results are available in Appendix A3. The p-value of Hausman test is 0 suggesting that Fixed Effects model is more suitable for the current data. The result of only the selected model (Fixed Effects model) is given in Table 2.

P value (0) shows the model is significant and overall r square of 0.4333 suggests that 43.33% of variation in beta can be explained by the variables taken in the study.

Homoskedasticity is an important assumption in linear regression which means constant variance of error terms. Heteroskedasticity is the opposite condition. i.e. when variances of errors are not constant. T test might be rendered invalid if problem of heteroskedasticity persists. So, heteroskedasticity corrected robust errors need to be found out for reliable results (Gujarati, 2003). Results of fixed effects regression model, with robust errors are given in Table 3:

Based on significance level of 5 %, the variables which are significant in the model are highlighted. Out of the 11 variables, only 6 are found to be statistically significant in explaining the variation in beta, rest 5 are insignificant. The significant variables are ROCE, PB, Net profit margin, asset growth rate, interest rate and Current Account Balance as percentage of GDP. From the coefficient values, it can be concluded that ROCE and asset growth positively affect beta, while, PB, net profit margin, current account balance as percentage of GDP and interest rate, all negatively affect beta.

Table 2: Fixed Effects Regression Model Results

R-Sq:			**Obs Per Group:**			
within = 0.4354			min	=	14	
between = 0.6093			avg	=	14	
overall = 0.4333			max	=	14	
			F(11,67)	=	4.7	
corr(u_i, Xb) = 0.1220			Prob > F	=	***0***	
Beta	**Coef.**	**Std. Error**	**T**	**P>T**	**[95% Conf. Interval]**	
ROCE	0.026489	0.005854	4.53	0	0.014805	0.038173
PB	-0.04255	0.016563	-2.57	0.012	-0.07561	-0.00949
PBT	-1.2E-05	4.91E-06	-2.45	0.017	-2.2E-05	-2.20E-06
Net profit margin	-0.02639	0.010897	-2.42	0.018	-0.04814	-0.00464
Asset growth	0.524013	0.165138	3.17	0.002	0.194397	0.853629
PE	0.010236	0.004235	2.42	0.018	0.001784	0.018688
FL	0.001158	0.001893	0.61	0.543	-0.00262	0.004937
Annual gdp growth rate	-0.01129	0.026446	-0.43	0.671	-0.06407	0.0415
CAB	-0.04792	0.023814	-2.01	0.048	-0.09545	-0.00039
Interest rate	-12.1452	3.509523	-3.46	0.001	-19.1502	-5.14016
R&D intensity	-1.29585	2.497581	-0.52	0.606	-6.28104	3.689345
_cons	1.373283	0.37196	3.69	0	0.630848	2.115719

Table 3: Fixed Effects Regression Model Results with Robust Errors

Fixed-Effects (Within) Regression			**Number of Obs**		**84**	
Group variable: var3			Number of groups		6	
R-sq:			Obs per group:			
within = 0.4354			min	=	14	
between = 0.6093			avg	=	14	
overall = 0.4333			max	=	14	
			F(5,5)	=	.	
corr(u_i, Xb) = 0.1220			Prob > F	=	.	
Beta	**Coef.**	**Robust Std. Error**	**T**	**P>T**	**[95% Conf. Interval]**	
ROCE	0.026489	0.002619	10.11	0	0.019756	0.033222
PB	-0.04255	0.012856	-3.31	0.021	-0.0756	-0.00951
PBT	-1.2E-05	5.54E-06	-2.16	0.083	-2.6E-05	2.26E-06
Net profit margin	-0.02639	0.005044	-5.23	0.003	-0.03936	-0.01343
Asset growth	0.524013	0.189662	2.76	0.04	0.036471	1.011555
PE	0.010236	0.005032	2.03	0.098	-0.0027	0.023171
FL	0.001158	0.001775	0.65	0.543	-0.0034	0.00572
Annual gdp growth rate	-0.01129	0.029173	-0.39	0.715	-0.08628	0.063705
CAB	-0.04792	0.016011	-2.99	0.03	-0.08908	-0.00676
Interest rate	-12.1452	3.648837	-3.33	0.021	-21.5248	-2.76556
R&D intensity	-1.29585	3.437156	-0.38	0.722	-10.1313	7.539644
_cons	1.373283	0.4855	2.83	0.037	0.125266	2.621301
sigma_u	0.101067					
sigma_e	0.24001					
rho	0.150615	(fraction of variance due to u_i)				

5. CONCLUSIONS

The objective of the current paper is to find out the financial and macro-economic variables that are significant in explaining variations in beta. Panel data regression model (fixed effects) is used for analysis. Out of the 11 variables (8 company specific and 3 macro-economic) in final regression model,6 came out to be significant (4 company

specific and 2 macro-economic). Out of the company specific financial variables, Return on Capital Employed (ROCE) and Asset growth are positively and significantly related to systematic risk (beta), whereas Price to Book ratio (PB) and net profit margin are negatively related to beta. Profit before Tax, Price Earnings Ratio, Financial Leverage and Research &Development Intensity are found to be statistically insignificant. ROCE shows both the efficiency with which the capital is used in the business as well as profitability from the point of view of investors. Theoretically, better efficiency and higher profitability should provide a cushion for firms to be able to respond to market risks and hence lower the systematic risk for firms. However, in the context of ROCE, our result contradicts with theory, but many studies have shown positive relationship only, such as those by Castagna & Matolcsy (1978), Mardini (2013), Angel et al. (2018), Kumar et al. (2015) & Iqbal & Shah (2012). The positive and significant relation between beta and assets growth might reflect the investors' growing concern about the Indian IT industry getting saturated gradually. Also, companies with high growth want more resources, which need extra financing from capital markets, causing the firms to be more exposed to market movements and hence high beta values. As expected net profit margin is negatively related to beta since firms with high profits are more capable of managing risk and hence have lower systematic risk. The Price to Book ratio is also negatively related. This can be explained by the fact that PB ratio takes into account market information i.e. market price. Higher confidence of investors increases the PB ratio and at the same time, safeguards the company from market risk, leading to lower beta values.

Out of macro-economic variables, interest rate and current account balance as percentage of GDP are negatively and significantly related to systematic risk. Annual GDP growth rate is insignificant in explaining variations in beta. One plausible reason for the negative relation between interest rate and beta is that increase in interest rate leads to increase in the value of currency of a country. Our sample is IT stocks whose major revenue is from exports of their products and services. Increase in value of currency improves a country's position and international trade which must have led to decrease in risk for this sector. Current account balance shows a country's competitiveness in the international market. The more competitive a country is, the lesser is the risk that the investors expect from that country's markets. Our result reassures this belief. These results also corroborate the study on world market betas by Arfaoui & Abaoub (2010) showing negative relation of world market systematic risk with both trade openness as well as world interest rates. While studies by Robichek & Cohn (1974) and Boz et al. (2015) showed that beta varies with real economic growth, the present results show that annual GDP growth rate is not significant in explaining variation in beta.

The results of this paper can help managers understand the major factors affecting systematic risk which in turn can guide them towards a better understanding of their effects on cost of capital and value of the firm. Beta, being one of the most critical factors considered while making financial decisions, this study can be used by investors as well. The variables found significant in the study can help forecast the likely movement of future beta values which can be very valuable for investors in financial decision making.

Limitation of this study is that it is based on data of only 6 companies in the IT sector for 14 years. Future studies can increase the sample size for more precision of results.

6. NOTES

The Index Maintenance Sub-Committee of National Stock Exchange (NSE) replaced KPIT Technologies LTd. (KPIT) from

various indices, including Nifty IT Index, with effect from 28th September 2018. This was done on account of some arrangement for demerger. However, the current study pertains to years 2004 to 2017; hence KPIT is included in this study. More information about this change in indices can be gathered from the following website link (retrieved on 14th April 2019):

http://www.niftyindices.com/Press_Release/ind_prs31082018.pdf

REFERENCES

1. *Al-Qaisi, K. M. (2011). The economic determinants of systematic risk in the Jordanian capital market. International Journal of Business and Social Science, 2(20).*
2. *M. Tamilselvan & V. Manjula, "Price Earnings Ratio and Financial Performance Nexus Using 81 Panel Data Regression Model: the Case of Oman",International Journal of Business Management & Research (IJBMR) ,Vol. 6, Issue 2,pp, 79-84*
3. *Andersen, T. G., Bollerslev, T., Diebold, F. X., & Wu, J. (2005). A framework for exploring the macroeconomic determinants of systematic risk. American Economic Review, 95(2), 398404.*
4. *Sasikumar Gnanasekaran & Sivasangari Ayyappan, "Development of a Decision Support System for Solar Panel Selection Using Integrated Analytic Hierarchy Process and Grey Relational Analysis",International Journal of Mechanical and Production Engineering Research and Development (IJMPERD),Vol. 8, Issue 1,pp, 1097-1106*
5. *Angel, K., Menéndez-Plans, C., &Orgaz-Guerrero, N. (2018). Risk management: comparative analysis of systematic risk and effect of the financial crisis on US tourism industry: Panel data research. International Journal of Contemporary Hospitality Management, 30(3), 19201938.*
6. *Albert Omolegbé KOUKPOSSI, "A Pragmatic Analysis of Donald Trump's Remarks at Women's Empowerment Panel",International Journal of Linguistics and Literature (IJLL), Vol. 9, Issue 6, pp; 43–54*
7. *Arfaoui, M., &Abaoub, E. (2010). The determinants of systematic risk: international evidence from the macro-finance interface. Journal of Advanced Studies in Finance, 1(2), 121143.*
8. *Aruna, D. C., &Warokka, A. (2013). Systematic risk and accounting determinants: a new perspective from an emerging market. Journal for Global Business Advancement, 6(1), 2437.*
9. *Olivia Nyahokwe, "The Impact of Exchange Rate on Trade Balances in South Africa: A Sectorial Analysis",International Journal of Humanities and Social Sciences (IJHSS),Vol. 9, Issue 1, pp; 43–56*
10. *Biase, P.D. &D'Apolito, E. (2012). The determinants of systematic risk in the Italian banking system: a cross-sectional time series analysis. International Journal of Economics and Finance, 4(11), 152164.*
11. *Borde, S. F. (1998). Risk diversity across restaurants: An empirical analysis. Cornell Hotel and Restaurant Administration Quarterly, 39(2), 6469.*
12. *Boz, G., Menéndez-Plans, C., &Orgaz-Guerrero, N. (2015). The systematic-risk determinants of the European accommodation and food services industry in the period 2003-2011. Cornell Hospitality Quarterly, 56(1), 4157.*
13. *Castagna, A. D., &Matolcsy, Z. P. (1978). The relationship between accounting variables and systematic risk and the prediction of systematic risk. Australian Journal of Management, 3(2), 113126.*
14. *Gu, Z. and Kim, H. (2002) "Determinants of restaurant systematic risk: A re-examination," Journal of Hospitality Financial Management: Vol. 10:Iss. 1, Article 2. Available at: http://scholarworks.umass.edu/jhfm/vol10/iss1/2*
15. *Gujarati, D. N. (2003), Basic Econometrics, 4th edn (New York: McGraw-Hill International).*

16. *IBEF (2019), IT &ITeS Industry in India, retrieved on 13th March 2020 from https://www.ibef.org/industry/information-technology-india.aspx*
17. *Im, K. S., Pesaran, M. H., & Shin, Y. (2003). Testing for unit roots in heterogeneous panels. Journal of econometrics, 115(1), 5374.*
18. *Iqbal, M. J., & Shah, S. Z. A. (2012). Determinants of systematic risk. The Journal of Commerce, 4(1), 4756.*
19. *Jiao, D. (2013). Demand volatility, operating leverage and systematic risk in hospitality industry. Universiteit van Tilburg.*
20. *Jordon,B.D., Ross, S.A., Westerfield, R.W. Fundamentals of Corporate Finance 8th ed. Standard ed. New York, NY: Mc Graw Hill.*
21. *Karakus, R. (2017). Determinants of affecting level from systematic risk: Evidence from BIST 100 companies in Turkey.*
22. *Kim, H., Gu, Z., & Mattila, A. S. (2002). Hotel real estate investment trusts' risk features and beta determinants. Journal of Hospitality & Tourism Research, 26(2), 138154.*
23. *Kim, H., Kim, J., & Gu, Z. (2012). An examination of US hotel firms' risk features and their determinants of systematic risk. International Journal of Tourism Research, 14(1), 2839.*
24. *Kumar, V., Aleemi, A. R., & Ali, A. (2015). The Determinants of systematic risk: Empirical evidence from Pakistan's banking sector. Global Management Journal for Academic & Corporate Studies, 5(1), 146.*
25. *Lee, J. S., & Jang, S. S. (2007). The systematic-risk determinants of the US airline industry. Tourism Management, 28(2), 434442.*
26. *Logue, D. E., &Merville, L. J. (1972). Financial policy and market expectations. Financial Management, 3744.*
27. *Mardini, M. (2013). Analyzing the determinants of systematic risk in the Jordanian banking sector.*
28. *Mar-Molinero, C., Menéndez-Plans, C., &Orgaz-Guerrero, N. (2017). Has the 2008 financial crisis changed the factors determining the systematic risk of shares in the "European Hospitality Industry"? (2003–2013). Journal of Hospitality and Tourism Management, 31, 5969.*
29. *Martikainen, T. (1991). On the significance of the economic determinants of systematic risk: empirical evidence with Finnish data. Applied Financial Economics, 1(2), 97104.*
30. *Oikonomou, I., Brooks, C. and Pavelin, S. (2012) the impact of corporate social performance on financial risk and utility: a longitudinal analysis. Financial Management, 41 (2). pp. 483515.*
31. *Patel, R. C., & Olsen, R. A. (1984). Financial determinants of systematic risk in real estate investment trusts. Journal of Business Research, 12(4), 481-491.*
32. *Robichek, A. A., & Cohn, R. A. (1974). The economic determinants of systematic risk. The Journal of Finance, 29(2), 439447.*
33. *Rasheed, W., Ahmed, S., &Ghyadh, N. (2016). Investigation Potential Flow About Curved Wing Using Panel Method. International Journal of Mechanical and Production Engineering Research and Development (IJMPERD) ISSN (P), 22496890.*
34. *Prakash, P., & AR, A.A Review on Different Approaches to Efficiently Detect and Recognize Information from Traffic Panels.*
35. *Raghu, N., Tejaswini, G. V., &AparnaRao, S. L. (2013).Simulation of 13 Panels Phased Array Antenna by Using STK Tool. International Journal of Electronics and Communication Engineering, 2(4), 19-24p.*

36. *Kumar, R., & Kumar, S. (2018). Estimation of solar panel power for irrigated crops in northern gangetic plains. Internat.J. Agric. Sci. & Res, 8 (1), 91, 104.*

Websites

- Share price data was retrieved on 6th June, 2018, from: https://nseindia.com/products/content/equities/equities/eq_security.htm
- Corporate actions' information like bonus issue and share splits were taken on 10th June 2018, from: http://www.capitalmarket.com/Company-Information/Corporate-actions/Bonus-Issues/HCL-Technologies-Ltd/5656
- Financial data of companies was retrieved from: https://prowessiq.cmie.com/
- Macro-economic data was retrieved on 10th July 2018, from the following website links: http://unctadstat.unctad.org/wds/ReportFolders/reportFolders.aspx
- https://data.worldbank.org/indicator/NY.GDP.MKTP.CD
- https://www.msci.com/end-of-day-data-search
- https://dbie.rbi.org.in/DBIE/dbie.rbi?site=home
- http://data.imf.org/regular.aspx?key=61545861

APPENDIX

A1: Unit Root Test Results (P Values)

Table 4

Variables	Level	1st Difference
beta	0.0005	
ROCE	0.541	0
PB	0.2727	0.0002
PBT	1	0
Net profit margin	0.1054	0
Asset growth	0.0387	
PE	0.0438	
FL	0.0004	
Annual gdp growth rate	0.0003	
CAB	0.0475	
Interest rate	0.0252	
R&D intensity	0.6109	0

A2: Correlation Matrix

Table 5

	ROCE	PB	PBT	Net Profit Margin	Asset Growth	PE	FL	R&D Intensity	Annual Gdp Growth Rate	CAB	Interest Rate
ROCE	1										
PB	0.4412	1									
PBT	0.2547	-0.006	1								
Net profit margin	0.6413	0.2235	0.3289	1							
Asset growth	-0.051	-0.002	0.1484	0.1829	1						
PE	0.1837	0.4308	-0.021	-0.0546	0.0814	1					
FL	-0.058	-0.176	0.0104	-0.0618	0.1049	-0.036	1				

R&D intensity	-0.044	-0.055	-0.072	-0.0396	0.0474	-0.083	0.126	1			
Annual gdp growth rate	0.3144	0.5457	-0.033	0.3326	0.1937	0.2824	0.1029	-0.003	1		
CAB	0.2243	0.1368	-0.13	0.0766	0.1056	0.2154	-0.035	0.0071	0.3996	1	
Interest rate	-0.005	-0.19	0.1853	-0.1242	0.0076	0.151	0.0426	0.0609	-0.5409	-0.189	1

A3: Fixed Effects Regression, Random Effects Regression and Hausman Test Results

Table 6: Fixed Effects Regression Results

R-Sq:			**Obs Per Group:**			
within = 0.4354			min	=	14	
between = 0.6093			avg	=	14	
overall = 0.4333			max	=	14	
			F(11,67)	=	4.7	
corr(u_i, Xb) = 0.1220			Prob > F	=	***0***	
Beta	**Coef.**	**Std. Error**	**T**	**P>T**	**[95% Conf. Interval]**	
ROCE	0.026489	0.005854	4.53	0	0.014805	0.038173
PB	-0.04255	0.016563	-2.57	0.012	-0.07561	-0.00949
PBT	-1.2E-05	4.91E-06	-2.45	0.017	-2.2E-05	-2.20E-06
Net profit margin	-0.02639	0.010897	-2.42	0.018	-0.04814	-0.00464
Asset growth	0.524013	0.165138	3.17	0.002	0.194397	0.853629
PE	0.010236	0.004235	2.42	0.018	0.001784	0.018688
FL	0.001158	0.001893	0.61	0.543	-0.00262	0.004937
Annual gdp growth rate	-0.01129	0.026446	-0.43	0.671	-0.06407	0.0415
CAB	-0.04792	0.023814	-2.01	0.048	-0.09545	-0.00039
Interest rate	-12.1452	3.509523	-3.46	0.001	-19.1502	-5.14016
R&D intensity	-1.29585	2.497581	-0.52	0.606	-6.28104	3.689345
cons	1.373283	0.37196	3.69	0	0.630848	2.115719

Random Effects Regression Model Results

Table 7

Random-Effects GLS Regression			**Number of Obs = 84**			
Group Variable: Var3			**Number of Groups = 6**			
R-Sq:			**Obs Per Group:**			
within = 0.4248			min = 14			
between = 0.6891			avg = 14.0			
overall = 0.4483			max = 14			
Wald chi2(11) = 58.50						
corr(u_i, X) = 0 (assumed) Prob > chi2 = 0.0000						
Beta	**Coef.**	**Std. Error**	**Z**	**P>Z**	**[95% Conf. Interval]**	
ROCE	0.0277307	0.00598	4.64	0	0.0160102	0.039451
PB	-0.0374625	0.01675	-2.24	0.025	-0.0702925	-0.00463
PBT	-0.0000158	3.77E-06	-4.19	0	-0.0000232	-8.4E-06
Net profit margin	-0.0245007	0.011154	-2.2	0.028	-0.0463625	-0.00264
Asset growth	0.5712645	0.161205	3.54	0	0.2553095	0.88722
PE	0.0080236	0.003895	2.06	0.039	0.0003897	0.015657
FL	0.002587	0.00188	1.38	0.169	-0.0010984	0.006272
Annual gdp growth rate	-0.0153919	0.027256	-0.56	0.572	-0.0688131	0.038029
CAB	-0.0476804	0.024527	-1.94	0.052	-0.0957521	0.000391
Interest rate	-11.38306	3.542654	-3.21	0.001	-18.32654	-4.43959
R&D intensity	-2.814261	2.522581	-1.12	0.265	-7.758428	2.129906

_cons	1.412638	0.383804	3.68	0	0.6603957	2.164881
sigma_u 0						
sigma_e.24001						
rho 0 (fraction of variance due to u_i)						

Hausman Test Results

Table 8

	Coefficients			
	(b)	**(B)**	**(b-B)**	**Sqrt(Diag(V_b-V_B))**
	Fe	**Re**	**Difference**	**S.E.**
ROCE	0.026489	0.0277307	-0.001242	.
PB	-0.0425529	-0.0374625	-0.00509	.
PBT	-0.000012	-0.0000158	3.80E-06	3.14E-06
Net profit margin	-0.0263913	-0.0245007	-0.001891	.
Asset growth	0.524013	0.5712645	-0.047252	0.035827
PE	0.0102358	0.0080236	0.002212	0.001662
FL	0.0011577	0.002587	-0.001429	0.000222
Annual gdp growth rate	-0.011286	-0.0153919	0.004106	.
CAB	-0.0479193	-0.0476804	-0.000239	.
Interest rate	-12.1452	-11.38306	-0.762133	.
R & D intensity	-1.295847	-2.814261	1.518414	.

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2 (10) = (b-B)'[(V_b-V_B)^(-1)](b-B)= 44.06

Prob>chi2 = 0.0000

(V_b-V_B is not positive definite)

Fixed effects model is preferable